

Important SQL Interview Questions

1. What is the difference between DELETE, TRUNCATE, and DROP?

- **DELETE:** Removes rows (can use WHERE), logs each row, rollback possible.
 - **TRUNCATE:** Removes all rows, faster, no WHERE, minimal logging.
 - **DROP:** Deletes the table structure and data permanently.
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2. What are Primary Key and Foreign Key?

- **Primary Key:** Uniquely identifies a record in a table, cannot be NULL.
 - **Foreign Key:** Links one table to another using the Primary Key of the parent table.
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3. Difference between WHERE and HAVING?

- **WHERE:** Filters rows **before** grouping.
 - **HAVING:** Filters groups **after** GROUP BY.
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4. Difference between INNER JOIN, LEFT JOIN, RIGHT JOIN, FULL JOIN?

- **INNER JOIN:** Returns matching rows from both tables.
 - **LEFT JOIN:** All rows from left + matching from right.
 - **RIGHT JOIN:** All rows from right + matching from left.
 - **FULL JOIN:** All rows from both (matched + unmatched).
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5. What is a Subquery?

- A query inside another query.
- **Types:**
 - Single-row (returns one value)
 - Multi-row (IN, ANY, ALL)
 - Correlated (depends on outer query).

6. Difference between UNION and UNION ALL?

- **UNION:** Combines results, removes duplicates.
 - **UNION ALL:** Combines results, keeps duplicates.
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7. Difference between CHAR and VARCHAR?

- **CHAR(n):** Fixed-length (pads spaces), faster.
 - **VARCHAR(n):** Variable-length, saves space.
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8. Difference between Clustered and Non-clustered Index?

- **Clustered Index:** Sorts and stores data physically in the table (1 per table).
 - **Non-clustered Index:** Stores pointers to data, can have many.
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9. Difference between DDL, DML, DCL?

- **DDL** (Data Definition): CREATE, ALTER, DROP.
 - **DML** (Data Manipulation): SELECT, INSERT, UPDATE, DELETE.
 - **DCL** (Data Control): GRANT, REVOKE.
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10. Difference between NULL and 0?

- **NULL:** Unknown / missing value.
 - **0:** Numeric value.
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11. Explain Window Functions.

- Functions that operate on a set of rows without collapsing them.
 - **ROW_NUMBER():** Unique sequence number.
 - **RANK():** Rank with gaps.
 - **DENSE_RANK():** Rank without gaps.

12. What is a CTE?

- **CTE (Common Table Expression):** Temporary result set defined with WITH.
 - Easier to read than subqueries, can be recursive.
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13. What are ACID properties?

- **Atomicity** – all or nothing.
 - **Consistency** – maintains data integrity.
 - **Isolation** – transactions don't affect each other.
 - **Durability** – committed data is permanent.
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14. Difference between EXISTS and IN?

- **IN:** Checks values in a list.
 - **EXISTS:** Checks if subquery returns rows (faster with large data).
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15. What is Normalization?

- Process of organizing data to reduce redundancy.
 - **1NF:** Atomic values.
 - **2NF:** No partial dependency.
 - **3NF:** No transitive dependency.
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16. What is Denormalization?

- Adding redundancy to improve performance (fewer joins, faster queries).
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17. What are Transactions?

- A unit of work executed as a whole.
- Controlled by: **BEGIN, COMMIT, ROLLBACK.**

18. How do you find the second highest salary?

```
SELECT MAX(salary)
FROM employees
WHERE salary < (SELECT MAX(salary) FROM employees);
```

19. What are Constraints in SQL?

- Rules applied on columns.
 - **NOT NULL** – No NULL values.
 - **UNIQUE** – Must be unique.
 - **PRIMARY KEY** – Unique + Not Null.
 - **FOREIGN KEY** – Links tables.
 - **CHECK** – Condition-based.
 - **DEFAULT** – Sets default value.
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20. Difference between Stored Procedure and Function?

- **Stored Procedure:** Can return multiple values, supports transactions, called with EXEC.
- **Function:** Returns a single value/table, can be used in SELECT.